

## Carbapenem Resistant Organism (CRO) Testing Instructions

### • CURRENT DCLS LABORATORY TESTING

Test Type	Method
Identification Confirmation	MALDI-TOF (Bruker Biotyper)
Antimicrobial Susceptibility Testing (AST)*	Broth Microdilution/Sensititre
Phenotypic testing - Carbapenemase Production	Modified Carbapenem Inactivation Method (mCIM)
Resistance Mechanism Identification	Real-Time PCR

\* Submitting laboratories are **REQUIRED** to provide AST results when submitting suspected CRO isolates to DCLS for testing. These AST results are assessed upon receipt to determine suitability for testing and potential pan-resistance.

### TESTING METHODS

- **mCIM** – Phenotypic testing for carbapenemase production will be performed for all Carbapenem Resistant Enterobacterales (CRE) and Carbapenem Resistant *Pseudomonas aeruginosa* (CRPA) isolates.
- **AST** – The following drug Minimum Inhibitory Concentration (MIC) values will be determined for all Carbapenem Resistant *Acinetobacter baumannii* (CRAB), as well as mCIM positive CRE and CRPA isolates:
  1. Amikacin
  2. Ampicillin (CRE only)
  3. Ampicillin/sulbactam (CRE/CRAB only)
  4. Aztreonam\* (CRE/CRPA only)
  5. Cefazolin (CRE only)
  6. Cefepime\*
  7. Ceftazidime\*
  8. Ceftazidime/avibactam (CRE/CRPA only)
  9. Ceftolozane/tazobactam (CRE/CRPA only)
  10. Ciprofloxacin
  11. Ertapenem (CRE only)
  12. Gentamicin
  13. Imipenem\*
  14. Levofloxacin
  15. Meropenem\*
  16. Piperacillin/tazobactam\*\*
  17. Tobramycin
  18. Tetracycline (CRE/CRAB only)
  19. Trimethoprim/sulfamethoxazole (CRE/CRAB only)

\* Testing required by the CDC's Antibiotic Resistance Laboratory Network (ARLN) for CRO isolates.

\*\* Testing required by the CDC's ARLN for *Pseudomonas aeruginosa* and *Acinetobacter baumannii* isolates.

- **Real-time PCR** - Analyses will be performed on the following resistance marker genes for Carbapenem Resistant *Acinetobacter baumannii* (CRAB) and mCIM positive CRE and CRPA isolates:
  1. KPC
  2. NDM
  3. OXA-48-like
  4. VIM
  5. IMP

### • SPECIMEN TYPES

- Pure suspect CRE isolates on slant or plate media.
  - 1) Member of the Enterobacterales family
  - 2) Resistance to at least 1 carbapenem:
    - imipenem, meropenem or doripenem = MIC of  $\geq 4$  µg/mL
    - ertapenem = MIC of  $\geq 2$  µg/mL

**Note:** *Morganella spp.*, *Proteus spp.*, and *Providencia spp.* have intrinsic elevated MICs to imipenem. MIC results for meropenem, doripenem, and/or ertapenem must be used to determine if these organisms should be forwarded to DCLS for testing.

- Pure suspect CRPA isolates on slant or plate media.
  - 1) Isolate identified as *Pseudomonas aeruginosa*
  - 2) Resistance to at least 1 carbapenem:
    - imipenem, meropenem or doripenem = **MIC of  $\geq 8$   $\mu\text{g/mL}$**
  - 3) Mucoid *Pseudomonas aeruginosa* isolates will NOT be tested
- Pure suspect CRAB isolates on slant or plate media.
  - 1) Isolate identified as *Acinetobacter baumannii* complex
  - 2) Resistant to at least 1 carbapenem:
    - imipenem, meropenem or doripenem = **MIC of  $\geq 8$   $\mu\text{g/mL}$**

### • **SPECIMEN TRANSPORT**

- Ship isolates at room temperature.
- Submit a completed DCLS Test Request Form with isolate, to include the following:
  - 1) Complete patient information (including address)
  - 2) Complete submitter information
  - 3) Date of specimen collection
  - 4) Specimen source
  - 5) Organism suspected
  - 6) On page 2 of the DCLS test request form check the box for “Carbapenem Resistant Organism” under “Bacteriology ID/ Detection”
  - 7) Outbreak ID number (if applicable)
- Include copy of laboratory’s susceptibility results in specimen package
- **Shipping Address:**

Division of Consolidated Laboratory Services  
 Attn: CRO Team  
 600 North 5<sup>th</sup> Street  
 Richmond, Virginia 23219

### • **RESULTS REPORTING**

- Alert value results (**results possibly requiring additional reference laboratory testing**) will be verbally reported within 1 working day of results. An alert notification will be sent to the CDC as well.
- Non-alert-value, positive results (**results NOT requiring additional reference laboratory testing**) will be verbally reported to the submitting laboratory within 2 working days of results.
- Negative results will not be verbally reported.
- A hard copy report of final test results will be provided to the submitter by mail.
  - CRAB isolates will include: identification, AST, and molecular results
  - mCIM positive CRE/CRPA isolates will include: identification, AST, phenotypic, and molecular results
  - mCIM negative CRE/ CRPA isolates will include: identification and phenotypic result only
- VDH will receive electronic reporting of results.
- Reference laboratory results for additional characterization testing will be provided to the submitting laboratory and VDH within 2 working days of receipt from the reference laboratory.

- **CONTACT INFORMATION**

- For questions regarding testing, specimen collection or shipment, please contact one of the following:
  - Dr. LaToya Griffin-Thomas (804-648-4480, ext. 281)
  - Microbial Reference Laboratory (804-648-4480, ext. 287 or 251)
  - Molecular Detection and Characterization Laboratory (804-648-4480, ext. 298)
  - DCLS 24/7 Emergency Mobile Number (804-335-4617)

- **RESOURCES**

Updated information on CRO testing can be found on the DCLS website, under the “Hot Topics” link:  
<https://dgs.virginia.gov/division-of-consolidated-laboratory-services/updates/hot-topics/>

Link to DCLS Test Request Form:

<https://dgs.virginia.gov/globalassets/document-center/dcls-forms/dcls-test-request-form-168572.pdf>